ELECTRICAL BOX SUPPORT

BACKGROUND OF THE INVENTION

This application relates to the art of electrical boxes and, more particularly, to supports for electrical boxes. The invention is particularly applicable to electrical boxes that are known as mud boxes or slab boxes used in poured concrete construction and will be specifically described with reference thereto. However, it will be appreciated that the invention has broader aspects, and that certain features of the invention may be used in other environments and for other purposes.

Electrical mud or slab boxes commonly are supported within a space between a pair of spaced-apart parallel concrete forms. The box is suitably supported in the space between the forms with the box open end in engagement with an inside surface of one of the forms. The space between the forms is filled with concrete and the forms are removed after the concrete has cured. The open end of the box then is accessible on an external surface of the concrete wall.

It is difficult to support the box in the space between the forms in a manner that prevents any movement of the box while the concrete is being poured. It would be desirable to have a support arrangement for the box that is easy to install while providing minimal possibility of box displacement during pouring of the concrete.

SUMMARY OF THE INVENTION

An electrical mud box of the type described is provided with spring legs that engage the inside surface of one form to bias the open end of the box against the inside surface of the opposite form. A bendable strap attached to the box can be wrapped around reinforcing bars within the space between the forms to further secure the box against displacement.

In one arrangement the spring legs are on generally U-shaped spring members that are secured to the box bottom wall. Two of the spring members provide four

spring legs that firmly and uniformly bias the open end of the box against the inside surface of a concrete form.

In one arrangement, the box bottom wall has a central external projection to which the spring leg members are attachable. Configuration of the box bottom wall and the spring leg members with cooperating attaching arrangements enables easy assembly of the spring leg members to the box in the field.

The attaching arrangement for the spring leg members may comprise a double keyhole slot formed by a central cylindrical hole having rectangular slots extending outwardly therefrom in opposite directions. A projection of the box bottom wall has a corresponding shape for reception in the double keyhole slot. The projection is undercut so that a spring member is rotatable 90° to lock a spring member to the box by way of the box projection overlying a spring leg member outwardly of the cylindrical attachment hole intermediate the attachment slots.

It is a principal object of the present invention to provide an improved arrangement for supporting an electrical box.

It is another object of the invention to provide an improved support arrangement for supporting an electrical mud box within concrete forms.

It is a further object of the invention to provide a mud box support arrangement that is automatically adjustable to support the box between a wide variety of concrete form spacings.

It is an additional object of the invention to provide an improved mud box support that is easily installed in the field.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective illustration of a mud box in accordance with the present application;

FIG. 2 is a perspective illustration of a bottom wall for the box of FIG. 1;

FIG. 3 is a plan view of the box bottom wall of FIG. 2;

FIG. 4 is a cross-sectional elevational view taken generally on line 4-4 of FIG. 3;

FIG. 5 is a partial cross-sectional elevational view taken generally on line 5-5 of FIG. 3;

FIG. 6 is an enlarged plan view of an attachment projection on the box bottom wall;

FIG. 7 is a side elevational view of the projection of FIG. 6;

FIG. 8 is a plan view of a locking strap;

FIG. 9 is an enlarged plan view of an attachment opening on the strap of FIG. 8;

FIG. 10 is a perspective illustration of a spring leg member;

FIG. 11 is a top plan view of the spring leg member of FIG. 10;

FIG. 12 is a side elevational view of the spring leg member of FIGS. 10 and 11;

FIG. 13 is a perspective illustration showing how the support legs of the present application are attached to a mud box;

FIG. 14 is a perspective illustration showing a mud box having the support arrangement of the present application attached thereto;

FIG. 15 is a plan view of a mud box having the support arrangement of the present application attached thereto;

FIG. 16 is a side elevational view of a mud box having the support arrangement of the present application attached thereto and showing the working range of the spring legs; and

FIG. 17 is a side elevational view showing a mud box in accordance with the present application supported between a pair of spaced-apart parallel concrete forms.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawing, wherein the showings are for purposes of illustrating a preferred embodiment of the invention only and not for purposes of limiting same, FIG. 1 shows a mud box A molded of plastic material with side walls 10, 11, 12 and 13 and a bottom wall 14. The end of the box opposite from bottom wall 14 is an open end as shown in FIG. 1. Connectors 20, 21, 22 and 23 are provided on the box side walls for attaching conduit, tubing or fittings thereto. Suitable openings or knockouts that are not shown are provided in box walls 10-13 in alignment with connectors 20-23.

As shown in FIGS. 2-5, flat and rectangular box bottom wall 14 includes a centrally located attachment projection B having a central cylindrical projection 30 extending upwardly from the outer surface of bottom wall 14. A transverse projection member 32 on the outer end of cylindrical portion 30 extends outwardly beyond cylindrical portion 30 in opposite directions to provide a generally T-shaped configuration as best shown in FIG. 4. Transverse projection 32 provides downwardly facing shoulders 34, 36 that are spaced above and face toward the outer surface of bottom wall 14. Transverse projection 32 has a width that is much smaller than the diameter of cylindrical portion 30 as shown in FIG. 3.

Abutments 40, 41, 42 and 43 extend upwardly from the outer surface of bottom wall 14 and are equidistantly spaced from one another outwardly of projection B. In effect, abutments 40-43 lie at the corners of a rectangle. Abutments 40, 41 and 42, 43 define a guideway therebetween that extends from top to bottom in FIG. 3 with

projection B at the center of the guideway. Projections 40, 43 and 41, 42 define a second guideway therebetween extending from left-to-right in FIG. 3 with projection B at the center of the guideway. The two guideways extend perpendicular to one another. One guideway is generally indicated by number 46 in FIG. 3 and the other guideway is generally indicated by number 48. Transverse projection 32 extends generally parallel to guideway 48 and perpendicular to guideway 46. Abutments 40 and 42 have sloping cam surfaces 50 and 52 that slope downwardly toward guideway 48. Cam surfaces 50, 52 also slope downwardly toward the outer surface of bottom wall 14 in a direction generally perpendicular to the longitudinal axis of transverse attachment projection 32.

FIGS. 8 and 9 show an elongated flat bendable metal strap C having a centrally located attachment opening D therein. Attachment opening D may be considered to have a double keyhole configuration with a central cylindrical portion 60, and rectangular slots 62 and 64 extending outwardly therefrom in opposite directions. As shown in FIG. 9, the diameter of circular portion 60 is greater than the width of rectangular slots 60, 62 as measured in a direction perpendicular to the longitudinal axis of strap C.

FIGS. 10-12 show a generally U-shaped spring leg member E having a flat central attachment portion 70 and opposite spring legs 72, 74 connected with flat attachment portion 70 by curved portions 76, 78. As shown in FIG. 12 for spring leg 74, each spring leg 72, 74 is inclined to the horizontal at an angle 80 at about 64°. Angle 80 may range from about 45° to about 75°, but around 64° has been found to be preferable.

Flat attachment portion 70 extends approximately across the entire width of bottom wall 14, and begins curving upwardly and outwardly at curved portions 76, 78 adjacent the intersection of the bottom wall with a sidewall.

Each spring leg 72, 74 has a spring leg end portion 82, 84 bent inwardly toward one another as at 86 and 88, are reversely curved as indicated at 90, 92 to

extend back toward flat attachment portion 70. Thus, legs 72 and 74 are inclined outwardly away from a longitudinal axis 94 in FIG. 12 that extends perpendicular to attachment portion 30 while end portions 82 and 84 are inclined back inwardly toward such axis. In the relaxed position of a spring leg member, end portions 90, 92 may be spaced-apart around 10 1/2 inches whereas box A measures only 4 inches on a side. Therefore, the leg end portions extend outwardly well beyond the box sides. The dimension of a spring leg member from attachment portion 70 to a reversely curved end portion 90 along an axis perpendicular to attachment portion 70 may be around 6 1/4 inches so that the spring legs extend well rearwardly of box A.

Reversely curved spring leg portions 90, 92 are longitudinally centrally notched as at 93, 95 to divide the end portions into a pair of spaced-apart relatively narrow reversely curved support end portions 90a, 90b and 92a, 92b. Thus, the leg end portions are bifurcated or forked. The width of each reversely curved support end portion 90a, 90b, 92a and 92b is less than one-third of the width of a spring leg 72, 74, and preferably close to around one-fourth of the width of a leg 72, 74. The width of notch 93, 95 then would be around one-third to one-half the width of a spring leg 72, 74.

Each reversely curved support end portion 90a, 90b, 92a or 92b preferably has a width that is not greater than the space between a pair of such support end portions on one spring leg. The curvature of a support end portion is provided so that a curved surface engages the inner surface of the concrete form rather than a terminal end of a spring leg. This shaping and bifurcating of the spring leg end portions significantly reduces the area or footprint of a spring leg end portion that is exposed at the surface of a finished concrete wall.

Spring leg member E preferably is formed of tempered spring steel although it will be appreciated that other materials including plastics may be used for certain purposes. In a most preferred arrangement, spring leg member E is made of spring temper stainless steel so that no rust will bleed from a spring leg at a surface of a

concrete wall where an end portion 90 or 92 of a spring leg is exposed. When stainless steel is not used, the reversely curved end portions of the spring legs may be coated with a rubberized or plastisol coating if so desired to prevent rust bleed through.

Attachment portion 70 of spring leg member E has a centrally located attachment opening F that corresponds in size and shape to attachment opening D in strap C. Thus, attachment opening F may be considered to have a double keyhole configuration with a central cylindrical portion 106 having centrally located rectangular slots 108 and 110 extending outwardly therefrom in opposite directions. The width of rectangular slots 108 and 110 is much smaller than diameter of central cylindrical portion 106. In the arrangement shown and described, bottom wall 14 is a separate member that is attached to the remainder of the box with screws or other suitable fasteners. However, it will be appreciated that the wall of the box could be integrally formed with the remainder thereof.

Attachment openings D in strap C and F in spring leg opening E are sized and shaped for close reception of box attachment projection B therethrough. The box support arrangement is attached to a box as shown in FIG. 13. Attachment projection B is extended through the attachment opening D in a flat strap C, and with strap C closely received in the left-to-right guideway that is formed between abutments 40, 43 and 41, 42. The abutments then prevent rotation of strap C relative to box A. Next, a spring leg member E is positioned with attachment projection B extending through attachment opening F. Flat attachment portion 70 and parts of curved portion 76, 78 are then received in the left-to-right guideway between abutments 40, 43 and 41, 42 on top of strap C. Next, another spring leg member E' is positioned with attachment projection B extending through attachment opening F'. The thickness of strap C, attachment portion 70 and attachment portion 70' is such that all three are received in the space between the outer surface of bottom wall 14 and shoulders 34, 36 on attachment projection B in FIG. 4.

Spring leg members 72', 74' are bent toward one another to the configuration shown in FIG. 13 and spring leg member E' is rotated clockwise as indicated by arrow 120. Although a generally flat configuration is shown for attaching portion 70' in FIG. 13, it will be recognized that attaching portion 70' actually assumes a shallow generally U-shaped curvature when legs 72', 74' are bent toward one another. Attachment portion 70' then engages cam surfaces 52, 54 on abutments 40, 42 for permitting clockwise rotation of spring leg member E' 90° until attachment portion 70' is received within the top-to-bottom guideway between abutments 40, 41 and 42, 43. The spring leg member E' then is released, and abutments 40-43 prevent rotation of all three members C, E and E'.

When spring leg member E' is rotated 90° clockwise, attachment projection shoulders 34, 36 of FIG. 4 extend outwardly beyond cylindrical hole 60' at locations midway between opposite slots 108', 110' to prevent removal of spring leg member E' from attachment projection B. This also holds strap C and spring leg member E on the box. The final assembly is illustrated in FIGS. 14 and 15.

Configuring attachment projection with a relatively large diameter cylindrical portion 30 provides very high strength and minimizes the possibility that the attachment projection will be broken off from the box bottom wall. At the same time, minimizing the width of transverse projection 32 enables the use of smaller rectangular openings for attachment openings D and F in strap C and spring leg member E so that the central attachment portion of the strap or spring leg member is not unduly weakened by the attachment opening.

Although the spring legs could be attached to the box in other ways and in other locations, the central attachment location insures that substantially uniform pressure will be applied for holding the periphery of the box open end against the inside surface of a concrete form.

FIG. 16 shows a typical working range for the spring legs by illustrating leg 74 in dotted line positions 74a and 74b. From the open end of an adapter A' on box A

to the reversely curved end 92 of leg 74, the free length 128 is 9 1/2 inches. The length 130 is 8 inches and the length 132 is 6 inches. Thus, the support arrangement may be used for supporting a box between concrete forms having form inner surfaces that are spaced anywhere from about 6 inches to about 8 inches. Obviously, the spring leg members may be made in other sizes, shapes and stiffnesses for supporting boxes in much wider range of spaces.

FIG. 17 shows a pair of spaced-apart parallel concrete forms 150, 152 having a space 154 therebetween and form inner surfaces 156, 158. A box and support assembly are positioned within space 154 with the open end of box A engaging inner form surface 158 and with the end portions of the four legs on spring members E, E' engaging form inner surface 156 for biasing the box open end against form inner surface 158. Strap C may be bent around reinforcing bars 153, 157 that typically are provided within space 154 to further prevent any movement of box A from its desired position. After space 154 has been filled with concrete that is allowed to cure, forms 150, 152 are stripped away, and the box and its support assembly remain within the concrete wall. The open end of the box is exposed at an outer surface of the concrete wall.

Although the invention has been shown and described with reference to a representative embodiment, it is obvious that alterations and modifications will occur to others skilled in the art upon the reading and understanding of this application. Therefore, it is to be understood that the invention may be practiced otherwise than as specifically described herein while remaining within the scope of the claims.